

VII. *On the habits and affinities of the Hymenopterous genus Scleroderma, with descriptions of new species.*  
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At the last meeting of this Society I exhibited a series of specimens of a new species of *Scleroderma*, which had emerged from a compact mass of delicate white cocoons occupying a portion of the empty cell of a *Raphiglossa*—one of the solitary wasps—which had constructed its larval receptacles in a desiccated briar recently obtained from Epirus. These *Sclerodermæ* were developed in September last from ova of the previous year, the briar having been cut and forwarded in the preceding month of December; and, in relating the following particulars of their habits and economy, I avail myself of the occasion to offer some remarks on the affinities of the genus, which have long been the subject of controversy.

The circumstance of finding this brood in such a locality would seem to indicate that the parent *Scleroderma* must have deposited her ova in the caterpillars stored in this cell by the original constructor for her own progeny; and that, in like manner, those which are found in houses—bringing themselves disagreeably to notice by their stinging propensities—may find a suitable domicile in the cells of *Odyneri* perforating the posts of verandahs, &c., and providing a similar nutriment for their larvæ. Mr. Haliday, however, took several specimens of both sexes of a *Scleroderma* in a chamber where *Attagenus Pellio* abounded in the mattresses stuffed with the husks of Indian corn; and on another occasion he found a swarm of the former between the sheets of a bed upon the sofa of a house at Lucca, probably stuffed, as he conceived, with hair or wool infested by the latter. (Thes. Ent. Oxon., p. 170; Hal. in litt.)

The *Sclerodermæ*, found alive on the present occasion, were closely congregated about their cocoons, having probably remained unnoticed for several days; and prominent among them was one furnished with elongate

opaque white wings, extending beyond the extremity of the abdomen, quiescent like the others.

It could scarcely be doubted that, among upwards of twenty specimens, both sexes would be represented; this winged individual, furnished with three ocelli towards the base of the head (which none of the others possessed), being presumably the male, as corresponding with the alary and ocellated characters of that sex. In other respects, however, this specimen exhibited a general similarity to the apterous females, the abdomen coinciding therewith in structural details; so that, notwithstanding the remarkable circumstance of the absence of any male, this was only an abnormally developed female invested with some of the prerogatives of both sexes; nor is this a solitary instance of such an anomaly, for Professor Westwood, in his crowning work, the 'Thesaurus Entomologicus Oxoniensis,' has recorded the circumstance that Mr. Thwaites had sent him "a species from Ceylon, the female of which has wings" (p. 170). I should add that no such discarded appendages were found in the cell, but a considerable number of very minute smooth white elongate-oval particles, of uniform size and shape, were dispersed about the interior, these being readily soluble, and apparently constituting the fecal deposits of the larvæ during the period of nutrition.

As regards the males, these might have been developed later from the remaining cocoons, wherein certain immature individuals were found, as subsequently adverted to, which might possibly have supplied the void had not these receptacles been molested for internal investigation. The fact of these females having been obtained from a briar-cell of the previous year, while allowing some latitude for climacteric retardation in the sequel, serves to indicate that this was the ordinary summer brood, and that no other could intervene between these females and their posterity of a corresponding period, their transformations having extended over more than twelve months, namely, from July or August of the one year to September of the next. I have, however, met with several females of this species hibernating in the snags of fig trees, which might obtain an earlier habitat for their progeny, and enable the latter to complete their metamorphoses within a shorter period. Thus the *Pelopæus spirifex* sometimes emerges from larval-cells of

the same year, while others remain in the pupal stage until the following season. So also with the *Cryptus* parasitic thereon; and a remarkable instance of similar incongruity has been recorded by the late Mr. F. Smith in *Osmia parictina* (Cat. Brit. Bees, 2nd edition, 1876, p. 150).

Having several miscellaneous species of living larvæ from the same locality, I placed a variety of these at the disposal of the *Sclerodermæ*, together with other tempting baits (having first secured the winged specimen), all being neglected alike. Three of the brood, which survived longer than the rest, had been fumigated with sulphur, together with others, and subsequently submerged in water during a whole night, but they resuscitated on the morrow. They were then treated with cyanide of potassium for some time; after which one again revived when expanded and gummed on a card.

In a few of the cocoons (four or five) the adult larvæ, or immature pupæ, were found as compressed yellow grubs, tapering at each extremity; and in two instances certain worm-like bodies, of a translucent piceous hue, exhibiting a somewhat segmental character, were protruding from the anal apex of these grubs, others of like nature being extracted singly from various cocoons whose inmates had quitted their domicile; the former being apparently the meconium which adult larvæ are accustomed to emit on the termination of the feeding stage.

The true males of *Scleroderma* were long undetermined, although Professor Westwood described two species, considered as such, in his monograph of this genus, published in the second volume of our Transactions (1837, p. 164), one of which he also figured (pl. xv., fig. 12); but in his 'Thesaurus' (1874) he completes the diagnosis of the genus from my specimens of a new species in the Hopeian Museum at Oxford, the veining of whose wings in the male corresponds with that of the winged female of *S. ephippium*. The two sexes of *S. cylindrica* were also figured by the late Mr. F. Smith from my specimens in the British Museum (B. M. Catal., part 3, 1855; Pl. iii. fig. 2 ♂, fig. 3 ♀), although the veining of the wings is very inadequately defined in the absence of an enlarged figure thereof.

The affinities of *Scleroderma* to the *Proctotrupidæ*, suggested in Prof. Westwood's aforesaid monograph, are supported by the ascertained economy of this species, as

congregating to form their cocoons in a collective series; for, when treating of this family in his incomparable 'Introduction to the Modern Classification of Insects,' he mentions that "in a few instances which have fallen under my observation, the pupæ are enclosed in a cocoon"; and that a species figured by DeGeer was "reared from minute cocoons attached together side by side" (vol. ii., p. 170).

In some of the genera, moreover (*Ceraphron*, *Diapria*, *Gonatopus*, &c.), the females are in like manner apterous; and those which Nees von Esenbeck has comprised in his subfamily *Dryineæ* are considered by this author to have their ovipositor "converted into a true sting" (*ibid.* 169, 172), as exemplified also in *Scleroderma*, whose oviduct accurately corresponds with Latreille's description of that of the *Proctotrupii* in his 'Genera &c.' (iv. 33), where he observes that this organ, "ex abdominis apice extimo prodiens, his retractilis, valvulis duabus tubum efficientibus, terebram proprie dictam et acicularem vaginantibus." Professor Westwood also remarks that in *Scleroderma* "the structure of the antennæ and ovipositor has not the appearance of those of a strictly aculeate Hymenopterous insect, as *Myrmecodes* or *Methoca*, whilst the generally small size of the *Sclerodermæ* is in favour of their relation with the *Proctotrupidæ*." (Monogr. p. 165).

Shuckard, in his Monograph of the '*Dorylidae*' (Ann. & Mag. Nat. Hist. vol. v. 1840, p. 263, note), disputes the aforesaid affinity, referring this genus "to the solitary *Heterogyna*," there being, as he conceived, "every probability that what is usually considered as the *Myzine* of Latreille are the true males of *Scleroderma*"; while citing the circumstance of having received from me specimens of both these genera taken in Greece, as if tending to support such an hypothesis!

Latreille, in his 'Genera &c.', also places *Scleroderma* among his '*Mutillariæ*' as a section of *Methoca*, ♀, although the antennæ of the former are 13-jointed in both sexes, and those of the latter 12-jointed in the female.

Jurine, in figuring the female *Methoca* under the name of *Mutilla formicaria*, speaks of this as "un individu remarquable, 1° parceque ce n'est pas une femelle de *Mutilla*, puisqu'il a sur la tête les trois petits yeux," &c. (Hym., vol. i., p. 266). He also observes, with reference to the presence or the absence of these ocelli in the

respective sexes of *Mutilla* :—"Quel a été le but de la nature en établissant de tels disparates, et quelle en est l'utilité? Ce sont de ces problèmes que nous ne pouvons pas résoudre, à cause de notre ignorance sur l'histoire de ces insectes, mais qui méritent bien de fixer l'attention des naturalistes" (p. 265).

It would seem, however, from the evidence now afforded, that the exceptional acquisition of ocelli and wings in certain females of *Scleroderma*, normally destitute of both, can only be ascribed to peculiar alimentary advantages derived by such gifted individuals during their earlier stages, thus promoting the development of obsolete functional endowments by the superabundance of nerve-power available to this effect; whereas, under ordinary circumstances, the habitual superfluity of such adjuncts in the economy of the females has involved an hereditary tendency to their absorption and abortion, as in the well known instances of the eyes of cave-insects, the membranous wings of many Coleoptera, and other corresponding examples of morphotic divergencies in the ocelli and wings among the *Chalcididae*, the neuters of ants, &c.

It is furthermore observable that, so far as hitherto exemplified, the presence of wings in either sex of *Scleroderma* invariably implies the co-existence of ocelli, though these are sometimes unaccompanied by the former, the primary exuberance of expansive energy being manifested in correlation with the latter.

Walker, in his 'Notes on *Chalcididae*,' adverts to the supposed analogy between *Scleroderma* and the *Agaonidae*, "dwellers in figs" (p. 59), as suggested by Dr. Coquerel in the 'Revue de Zoologie' (ser. 2, vol. vii. p. 366); the fact, however, being that the *apterous* individuals of the latter, to which this analogy is ascribed, are *males* having winged partners, whereas the converse is the case in the former. According to Walker "*Scleroderma* has no near affinity with the *Bethylidae*" (*Proctotrupidae*, pars); but, as he conceived, "it has some resemblance to the female Australian and South American *Thynnini*," and "seems to have more affinity with *Typhlopone*, the worker of *Labidus*, and with *Dichthadia glaberrima*,\* the supposed female of *Dorylus*."

\* This large, blind, apterous female has been recently obtained in South Africa from a nest of small eyeless ants (*Anomma*, Sm.), as related by Mr. Roland Trimen in our Proceedings (1880, pp. xxiv. and xxxiii.)



In importing *Typhlopone* into this discussion, Walker loses sight of the analogy suggested by Dr. Coquerel (*loc. cit.* p. 425) as regards this "blind ant" described by Professor Westwood,\* which Coquerel considers allied to his *eyeless Apocrypta* and *Sycoerypta*; while in the *latter* (and *not in Typhlopone*) he traces a partial resemblance to *Scleroderma* with *ample eyes*, his *Sycoerypta* having 3-jointed antennæ and *no palpi*, with *ventricose* basal segments to the abdomen, and being also of a different sex as aforesaid, both being equally irreconcilable with *Typhlopone* and *Dichthadia*.

When, however, among the repudiated *Proctotrupidæ*, already more or less corresponding with *Scleroderma* in structural details and economy, a large array of genera and species, including several with apterous females, coincides therewith in having 13-jointed antennæ in both sexes, as described by Professor Westwood, and figured in three elaborate folio plates of his 'Thesaurus' (xxix., xxx., and xxxi.), the natural affinities of this genus with the aforesaid group, thus constituting the subfamily *Epyrides*† proper, would seem to be incontestably established by these several connecting links.

I append a description of the species which has given rise to these remarks, together with that of two others taken by me in Epirus; and of a third in the British Museum, recently transmitted by the Rev. Thomas Blackburn from the Hawaiian Islands.

*Scleroderma ephippium*, n. s.

♀. *Caput* subquadratum, nigro-piceum, facie flavâ. *Mandibulæ* flavæ, apice nigrescentes, tridentatæ, dentibus duobus majusculis oblique positis, subacutis, tertio infra parvulo. *Oculi* compositi magni nigri. *Ocelli* obsoleti. *Antennæ* flavæ, capite dimidio longiores; scapo elongato recurvo, apice sensim largiore; articulo 2° brevior obconico; reliquis parvis, magnitudine paulatim crescentibus, longitudine latitudine cœqualibus, extimo

\* *Introd. Mod. Clas. &c.*, ii., pp. 218 note, 219, and 226, figs. 16, 17, 18, 19, 20, ♂, 1840; *Ann. Nat. Hist.*, vi., pp. 81, 87, October, 1841, plate 2, fig. 1, and details; Shuckard, *Ann. Nat. Hist.*, v., p. 262, June, 1840.

† The genus *Bethylus*, Latr. (*Omalus*, Jur.), has been restricted by Professor Westwood "to the flat-headed species which have the hind basal cell of the fore wings shorter than the front one, and which have 12-jointed antennæ" (*loc. cit.* p. 156).

præcedente dimidio longiore, apice conico. *Thorax* flavus, plus minusve obfuscatus, mesonoto antice lateribusque fuscis. *Alæ* obsoletæ. *Pedes* graciles, femoribus tibiisque medio fuscis, basi apiceque pallidis, coxis tarsisque flavis. *Abdomen* nigro-piceum, nitidum, elongato-ovale; oviductus valvulis paullulum prodientibus, externe nigris, terebra aciculariformi in iisdem retractili, longa, tenuissima, arcuata, flavescente, valida, munitum. Long. corp.  $2\frac{3}{4}$ — $3\frac{1}{2}$  mm.

Fœminæ alatæ unicæ, a sociis aliter haud distinguendæ, alarum diagnosis.

*Alæ* elongatæ, abdomine longiores, pellucidæ, flaccidæ, albescentes, nitidæ, ciliatæ, cellulis duabus basalibus venisque flavis instructæ: *alæ antice* costa tenuissima picea; vena postcostali apice lobo brevi crasso, stigma versus sed illud non attingente, antice projecto; stigmatate parvo, subquadrato, insulato luteo; vena media basali satis conspicua, apice cum postcostali oblique conjuncta; vena transverso-media retro ante analem abrupte truncata, apice dilatata; vena anali basi incrassata, ultra transverso-mediam subtilissime producta: *alæ postice* venis duabus abbreviatis, basi robustis coalitis, munitæ. Long. corp.  $3\frac{1}{2}$  mm. Exp. alar. antic.  $3\frac{1}{2}$  mm.

*Hab.* In Epiro rubis exsiccatas intra Eumenidarum cellulas in quibus proles educatur; necnon in Corcyra ficis ramis siccis hibernans.

In Mus. Britann., Hopeiano Oxoniæ, et nostro.

*Scleroderma gracilis*, n. s.

♀. Luteo-fulva, nitida, capite elongato, disco bivittato; oculis parvis nigris vix compositis; antennis brevibus tenuibus, flavescens; thorace antice valde attenuato, postice capite paulum angustiore, dimidio longiore, femoribus luteo-flavis, tibiis tarsisque pallidioribus; abdomine capitis thoracisque longitudine cœquali. Ocelli alæque obsoleti. Long. corp. 3 mm.

♂. (An hujus speciei?) Alatus, ocellatus, rufo-fulvus, nitidus, capite fusco, tarsis pallidis, alis hyalinis, venis flavis basi infuscatis. *Caput* mediocre, subrotundatum, antice productum, ore flavo, oculis compositis magnis rotundis argentatis, ocellis tribus albidis. *Thorax* gibbus elongatus antice attenuatus, mesonoto capite paulum latiore, metanoto tenuiore. *Abdomen* thoracis dimidio vix longius, mesonoto parum latius, postice fuscescente. Long. corp.  $2\frac{1}{2}$  mm. Exp. alar. antic.  $4\frac{1}{2}$  mm.

*Hab.* Montibus apud Zagori in Epiro, mense Augusto domi mas fœminaque semel lecti.

In Mus. nostro.

*Scleroderma coucinna*, n. s.

♂. Alatus, ocellatus, omnino fulvo-flavus, nitidus: capite parvo, subrotundato, oculis magnis vix compositis nigris, ocellis hyalinis, antennis gracillimis, articulorum externe angulis anticis prominulis, macula elongata frontali inter antennis nigra; thorace valde elongato, capitis abdominisque latitudine coequali, antice posticeque attenuato; alis fuliginosis venis flavis basi infuscatis; abdomine brevi, tenui, elongato-ovali, dimidio apicali paululum obscuriore. Long. corp. 2 mm. Exp. alar. antic.  $3\frac{1}{2}$  mm.

*Hab.* Prevesæ in Epiro, domi die 27 Julii, 1846, semel cepi.

In Mus. nostro.

*Scleroderma Polycesialis*, n. s.

♀. *Scleroderma piceæ*, Westw., affinis sed gracilior, antennis tarsisque brevioribus; picea, unicolor, punctulatissima, abdomine valde elongato, thoracis latitudine fere coequali, segmentorum basaliu quatuor margine postico luteo-flavo. Ocelli alæque obsoleti. Long. corp.  $3\frac{2}{4}$  mm.

*Hab.* Haleakalæ, in insula Hawaiiiana Maui dicta, ad altitudinem pedum 4000, inter folia sicca, a Dom. T. Blackburn lecta.

In Mus. Britannico.